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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/683,937	10/10/2003	Yihwan Kim	APPM/8538/TSG/EPI/RKK	2191

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EXAMINER	
TRINH, MICHAEL MANH	

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 06/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/683,937	KIM ET AL.	
	Examiner	Art Unit	
	Michael Trinh	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 March 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27 and 41-55* is/are pending in the application.

4a) Of the above claim(s) *41 and 43-55* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27 and 42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/10/03, 1/24/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☒ Other: *IDS 1/28/05; 4/28/05*.

DETAILED ACTION

*** This office action is in response to Applicant's election and amendment filed March 28, 2005. Claims 1-27 and 41-55 are pending, in which claims 43-55 have been newly added.

*** Note that the Information Disclosure Statement filed October 10, 2003 indicated 4 IDS sheets, but only 3 IDS sheets are included and submitted.

Election/Restrictions

1. Applicant's election filed of Group I, method claims 1-27 and 42 in Paper mail date March 28, 2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, and because the election is implicitly "without traverse", the election has been treated as an election without traverse (MPEP § 818.03(a)).

Newly added claims 43-55 drawn to deposit a second silicon germanium from Cl_2SiH_2 on a first silicon germanium from silane that is independent or distinct from the invention originally elected claims. Accordingly, claims 43-55 are constructively withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

2. Claims 41,43-55 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, without traverse as treated.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

4. Claims 1-10,12-24,26-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Oda et al (2001/0045604).

Oda teaches a method of depositing a silicon germanium film on a substrate comprising: providing the substrate within a process chamber; heating the substrate to a temperature in a range from about 500 to about 900 degree C (paragraph 100, lines 25-50) ; exposing the substrate to a deposition gas comprising SiH_4, GeH_4, HCl, a carrier gas of hydrogen and at least one dopant gas (paragraph 100, lines 7-25); and depositing a silicon germanium material epitaxially on the substrate. Re claim 2, wherein the at least one dopant gas is a boron containing compound selected from the group consisting of diborane (B_2H_6 in paragraph 0100). Re claim 3, wherein the silicon germanium material is deposited with a boron concentration in a range from about $1x10^{20}$ atoms/cm^3 (paragraph 0103). Re claim 4, wherein the at least one dopant gas includes a phosphorus containing compound of phosphine (PH3 I paragraph 0100). Re claim 5, wherein the carrier gas is hydrogen (paragraph 0100, lines 25-25). Re claim 6, wherein the deposition gas further comprises a member selected from the group of consisting of a carbon source, Cl_2SiH_2 (paragraph 0100, lines 7-45). Re claim 7, wherein the temperature is of 600° C or higher to about 900°C, wherein a temperature of 750°C is used, wherein the process chamber is at a pressure of 0.1 Pa (paragraph 0101; page 7, right column, lines 3-11, wherein 0.1 Pa is in the claimed range from about 0.1 Torr to about 200 torr). Re claim 8, wherein the silicon germanium film is grown to a thickness in a range from about 1nm to 50nm (paragraph 0103, page 7, right column). Re claim 9, wherein the silicon germanium film is deposited within a device used for CMOS, Bipolar or BiCMOS application (paragraphs 0003, 0010). Re claim 10, wherein a fabrication step is selected from the group consisting of contact plug, source/drain extension, elevated source/drain 13,14,134,135 and bipolar transistor with buffer layer 8 (Fig 3D; paragraphs 0089-0110,0103). Re claim 12, wherein a silicon-containing film 104 is deposited to the substrate before the silicon germanium film 105 (Fig 45; paragraph 0006; Fig 46; paragraph 0009; Figs 3e-3d; 4-6; paragraphs 0101-0104). Re claim 13, wherein the silicon-containing film is deposited from a process gas comprising Cl_2SiH_2 (paragraphs 0100,0103). Re claim 14, as already similarly applied in claims 1 and 3, with a dopant concentration of about $1x10^{20}$ atoms/cm^3 (paragraph 0103). Re claim 15, wherein the germanium source is selected from the group consisting of GeH_4 (paragraph 0100). Re claim 16, wherein the carrier gas is hydrogen (paragraph 0100, lines 25-25). Re claim 17, wherein the temperature is of 600° C or higher to about 900°C, wherein a temperature of 750°C is used. Re claim 18, wherein the etchant source

is selected from the group consisting of HCl, and Cl_2 (paragraph 0100). Re claim 19, wherein the at least one dopant gas is a boron containing compound selected from the group consisting of diborane (B_2H_6 in paragraph 0100). Re claim 20, wherein the at least one dopant gas includes a phosphorus containing compound of phosphine (PH3 I paragraph 0100). Re claim 21, wherein the deposition gas further comprises a member selected from the group of consisting of a carbon source, Cl_2SiH_2 (paragraph 0100, lines 7-45). Re claim 22, wherein the silicon germanium film is grown to a thickness in a range from about 1nm to 50nm (paragraph 0103, page 7, right column). Re claim 23, wherein the silicon germanium film is deposited within a device used for CMOS, Bipolar or BiCMOS application (paragraphs 0003, 0010). Re claim 24, wherein a fabrication step is selected from the group consisting of contact plug, source/drain extension, elevated source/drain 13,14,134,135 and bipolar transistor with buffer layer 8 (Fig 3D; paragraphs 0089-0110,0103). Re claim 26, wherein a silicon-containing film 104 is deposited to the substrate before the silicon germanium film 105 (Fig 45; paragraph 0006; Fig 46; paragraph 0009; Figs 3e-3d; 4-6; paragraphs 0101-0104). Re claim 27, wherein the silicon-containing film is deposited from a process gas comprising Cl_2SiH_2 (paragraphs 0100,0103).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 11 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oda et al (2001/0045604) taken with Steele et al (5,273,930) and Chu et al (2005/0045905).

Oda teaches a method for depositing a silicon germanium film as applied to claims 1-10,12,24,26-27 above.

Re claims 11 and 25, Oda and Steele lacks replacing SiH_4 by Cl_2SiH_2 to deposit a second silicon germanium film.

However, Steele teaches (at col 3, line 50 through col 4; cols 5-6) depositing a seed film to a first thickness, then replacing silane (SiH_4) by diclorosilane (Cl_2SiH_2) to deposit a second silicon germanium film to a second thickness on the seed film. Chu also teaches depositing a second silicon germanium film on a first silicon germanium seed film.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a silicon germanium of Oda by replacing silane (SiH_4) by diclorosilane (Cl_2SiH_2) to deposit a second silicon germanium film to a second thickness on the seed film, as taught by Steele and Chu. This is because of the desirability to improve performance of the product films, and to form a silicon germanium film having lower bandgap energy.

7. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oda et al (2001/0045604) taken with Chu et al (2005/0045905).

Oda teaches a method for depositing a silicon germanium film as applied to claims 1-10,12,24,26-27 above, and fully repeated herein, wherein the silicon-containing film epitaxially is selectively deposited on the substrate.

Re claim 42, Oda and Steele teaches carrier gas including hydrogen (as in claim 5, at paragraph 0100, lines 25-25), Claim 42 recites a carrier gas selected from the group consisting of N_2, Ar, He and combinations thereof.

However, Chu teaches (at paragraph 0034) , lines Steele teaches (at col 3, line 50 through col 4; cols 5-6) depositing a silicon germanium film, wherein a carrier gas is selected from the group consisting of one or more of H_2, N_2, Ar, He.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a silicon germanium film of Oda by selecting a carrier gas from the

group consisting of one or more of H_2, N_2, Ar, He, as taught by Chu. This is because these gases are alternative and art recognized equivalent for substitution as a carrier gas.

****

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272-1847. The examiner can normally be reached on M-F: 8:30 Am to 5:00 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application should be directed to the receptionist whose telephone number is (703) 308-0956.

Oacs-16

Michael Trinh
Primary Examiner